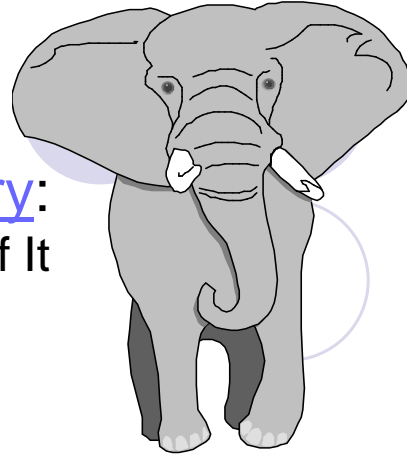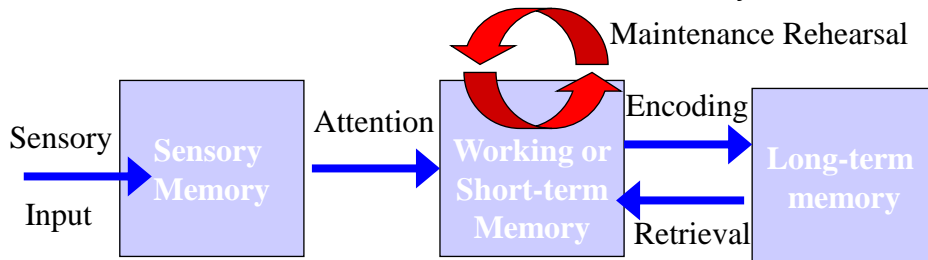# Memory:
The Long and Short of It

Memory's Beginnings

- Atkinson and Shiffrin (1968)
  - Encoding
    - *Converting information into a form that can be entered into memory*
  - Storage
    - *Retaining information over varying periods of time*
  - Retrieval
    - *Locating and accessing specific information when it is needed at later times*

Modal Model of the Mind

- Three memory store that differ in function, capacity and duration
- Control processes - control movement of information within and between memory stores

Maintenance Rehearsal

Sensory **Sensory Memory** → Attention → **Working or Short-term Memory** → Encoding → **Long-term memory**

Input

Retrieval

Sensory Memory

- Iconic Memory
  - ○ *Temporary visual buffer that holds visual information for brief periods of time*
    - Very brief
      - · Iconic: 1/10 second

  - ○ Visual Persistence
    - *The apparent persistence of a visual stimulus beyond its physical duration*
      - · *e.g. a wobbling pencil*

  - ○ Forgetting
    - Decay
    - Interference

Sensory Memory

- Echoic
  - *A brief memory system that receives auditory stimuli and preserves them for some amount of time*
    - Brief
      - 4-10 seconds

  - Forgetting
    - Decay
    - Interference

  - Information (stimuli) now transfer to STM
    - Attention

Short Term Memory

- Short-Term Memory (STM)
  - Temporary **storage (only)** of material
  - Capacity is 7$\pm$2 items (Miller's magic #)
  - Lasts for 20-30 seconds
    - Demonstration of STM

- Why such short duration?
  - Decay
    - *Loss of a memory trace due simply to the passage of time*

  - Interference
    - *Loss of a memory trace due to competition from other events*

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The Serial Position Curve
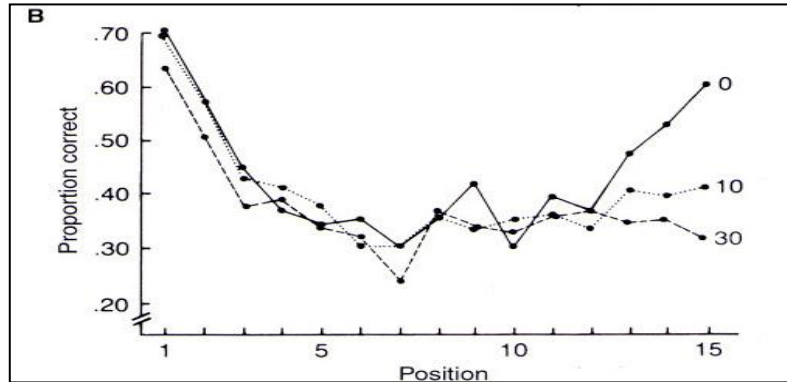
- Primacy
  - *Better memory for the first items in a list*

- Recency
  - *Better memory for the last items in a list*

The Serial Position Curve: Standard Explanations

- Primacy
  - A long-term memory effect.
  - First items in a list get the best and most rehearsal.

- Recency
  - A short-term memory effect.
 - Last items still in STM at time of recall.

Spacing Effect

Distributed rehearsal (spacing effect) is better than massed practice.

Implications for studying?

Organizational Schemes

- Mnemonics
  - *A technique or device that uses familiar associations to enhance the storage and the recall of information in memory*

- Memorization occurs with structure in some meaningful relationship

- A list of words or concepts are hierarchically organized as by a period or history or in a story

Working Memory
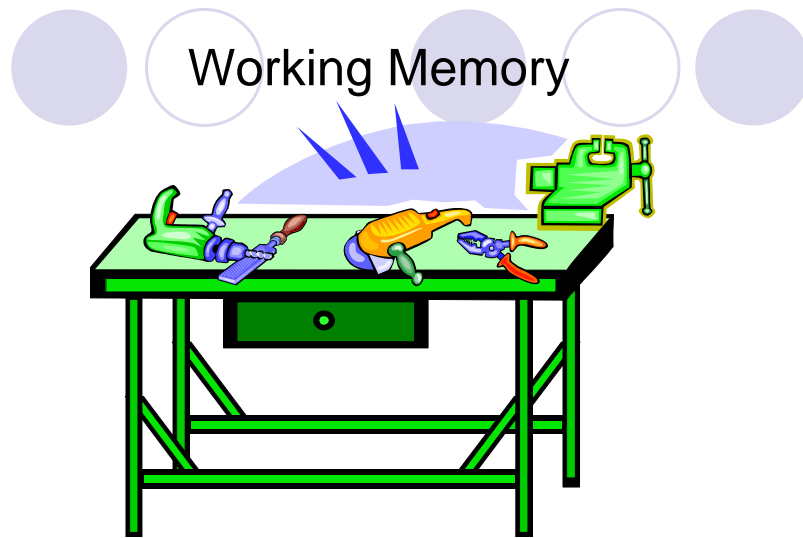
- Demonstration
  - Size Judgment Span Task

Squire's Taxonomy of Long-Term Memory
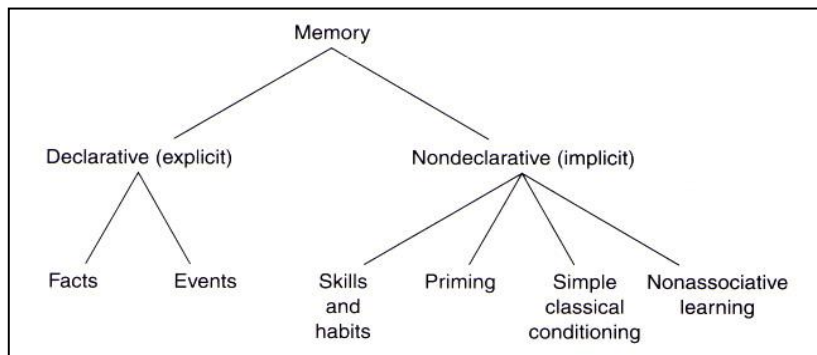
- Unknown capacity (huge)

- Unknown amount of time (unlimited)

Explicit Versus Implicit Memory

- Explicit
  - *Declarative*
  - *LTM knowledge that can be retrieved and then reflected on consciously.*

- Implicit
  - *Nondeclarative, Procedural*
  - *Knowledge that can influence thought and behavior without any necessary involvement of conscious awareness.*

Episodic Versus Semantic Memory

- Episodic (Autobiographical)
  - *Stores personally experienced events*
    - (e.g., your 10th birthday)
  - Flashbulb Memories
    - Vivid memories of what we were doing at the time of an emotion provoking event.
    - The research is mixed…

- Semantic
  - *Stores general world knowledge*
    - (e.g., concepts, categories, facts)

Priming

- Priming is the influence of one memory on another
- Priming is implicit because it does not depend on awareness and is automatic
- Activation not a conscious decision BUT, can effect subsequent thoughts and actions

Retrieving Information from Memory

- Retrieval Cues
  - *Stimuli that are associated with information stored in memory and aid in recall when recall is not spontaneous*

- Context-Dependant Recall
  - *Material learned in one environment or context is easier to remember in a similar environment or context*

- State-Dependent Recall
  - *It is often easier to recall material stored in LTM when our internal state is similar to that which existed when the information was first entered into memory*

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Level of Processing

- *The likeliness information will be retained*

- Shallow Processing
  - Verbally repeating a word
- Medium Processing
  - Do words rhyme?
- Deep Processing
  - Semantics

Availability Versus Accessibility

- Availability

  The memory trace exists / was encoded into long term memory.

- Accessibility

  Degree to which the memory trace can be retrieved now.

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Forgetting

- Retroactive Interference
  - New info interferes with old info (e.g., a busy signal erases memory of a phone number).

- Proactive Interference
  - Old info interferes with new info (e.g., walking today to where you parked your car yesterday).
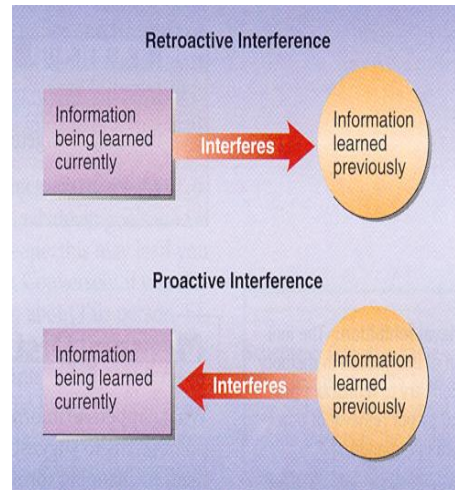
Retrieval Failure

- *When a memory is lost <u>in</u> the system versus lost <u>from</u> the system.*
  - Occurs when the information is *available*, but not *accessible*.
- Tip of the Tongue States
  - *When a person is temporarily unable to remember some shred of information that they know is stored in LTM*

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Amnesia

- Amnesia
  - *Loss of memory or memory abilities due to brain damage or disease.*
- Retrograde
  - *Loss of memory of events before the injury*
    - *The Bourne Identity*
- Anterograde
  - *Loss of memory of events after the injury / inability to form new memories*

The Case of Clive Wearing

If there was no memory every one would be a stranger to you, every language foreign, every task new, and even you yourself would be a stranger.

- Musician, conductor, producer
  - Viral Encephalitis
    - Both frontal lobes and hippocampus damaged
    - Semantic memory
      - *Honey, jam, marmalade*
      - *Ate a whole lemon*
      - *Mistook soap for toothpaste*

Eyewitness Testimony

- Memory can be distorted as people try to fit new info into existing schemas

- Eyewitnesses usually see something complex just once then have to remember it

- Sometimes new information is distorted by
  - fitting into an existing schema
  - subsequent information (famous experiment by Loftus)

Loftus Experiment

- Subjects shown video of an accident between two cars
- Some subjects asked: How fast were the cars going when they smashed into each other?
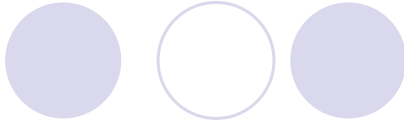- Others asked: How fast were the cars going when they hit each other?

Accident

Leading question:
"About how fast were the cars going when they *smashed* into each other?"

Memory construction

Loftus's Results

- Speed estimates depended on how the question was phrased

- Subjects memory for broken glass also depended on the phrasing of the speed question.
  - But this was a false memory: there was no broken glass

Word Used in Question	Average Speed Estimate
smashed	41 m.p.h.
collided	39 m.p.h.
bumped	38 m.p.h.
hit	34 m.p.h.
contacted	32 m.p.h.